Spatial integrated models foster complementarity between monitoring programs in producing large-scale ecological indicators

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Résumé

Obtaining relevant information about large-scale population dynamics from a single monitoring program is challenging, and often several sources of data, possibly heterogeneous, need to be integrated. In this context, spatial integrated models combine multiple data types into a single analysis to quantify population dynamics of a targeted population. Using available information at different spatial or temporal scales, spatial integrated models have the potential to produce detailed ecological estimates that would be difficult to obtain if data were analyzed separately. So far, these models are available for open populations to estimate demographic parameters (survival, recruitment), therefore requiring data collected in long-term monitoring programs. However, we often need to quantify population abundance and density in closed populations. Adapting the method developed by Chandler et al. (2018), we showcase the implementation of spatial integrated models to closed populations. We analyzed spatial capture-recapture data together with distance-sampling data to estimate abundance and density. Focusing on the Mediterranean bottlenose dolphins (*Tursiops truncatus*) as a case study, we combined 21,464 km of at-sea photo-identification surveys collecting spatial capture-recapture data with 24,624 km of aerial line-transect following a distance-sampling protocol. We compared the performances of the spatial integrated model, with that of the distance sampling model, and the spatial capture-recapture model separated. We discussed the benefits of using a spatial integrated model in the context of the assessment of French Mediterranean bottlenose dolphin conservation status to inform continental scale public policies. Spatial integrated models are widely applicable and relevant to conservation research and biodiversity assessment at large spatial scales.

REFERENCE

Chandler RB, Hepinstall-Cymerman J, Merker S, Abernathy-Conners H, Cooper RJ. 2018. Characterizing spatio-temporal variation in survival and recruitment with integrated population models. The Auk **135**:409–426.

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